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ABSTRACT

The Science Alliance, a coalition of industry, business, and educational institutions, developed and sponsored a partnership project to help elementary teachers overcome obstacles to teaching quality science. The intent of the Teacher-Scientist Partnership Project was to bring together the scientific expertise of scientists with the classroom expertise of teachers to help both become more confident and skilled at teaching elementary science. Twenty interested 4th- to 6th-grade teachers in New Castle County (Delaware) received 6 hours of training in the use of SAVI/SELPH, an activity-based module, plus materials and equipment for teaching the unit. Twelve teachers were paired with 11 scientists, making 11 experimental teams; 8 teachers, the control group, taught the unit on their own. Evaluation procedures included journals kept by scientists and teachers during the teaching experience; an evaluation conference attended by the participants; and questionnaires completed by scientists, teachers, and students at the end of the unit. Responses from the participant groups were very positive, and all but one of the partnerships worked very well. Lessons learned for the future were concered with materials and equipment, training, and guidance about how a partnership should work. (KR)

Scientists and Elementary Teachers: Partners in Science Teaching

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SCIENTISTS AND ELEMENTARY TEACHERS: PARTNERS IN SCIENCE TEACHING

The purpose of this paper is to (1) describe a project in which industry and university scientists were teamed with elementary teachers to team teach a unit in the teachers' classrooms and (2) report on the effectiveness of the project from the perspective of the teachers, scientists, and students.

SIGNIFICANCE

In the United States there has been a call from several sources for alliances among education, industry, and business that would pool their resources in efforts to improve science education. Sources include (1) private industry (for example, McBrayer, President of Exxon Chemical Company, 1989), (2) the federal government (as illustrated by P.L. 100-418, 1988, Title III which established funding for "Partnerships in Education for Mathematics, Science, and Engineering") and (3) non profit organizations, such as The Triangle Coalition (Fowler, 1989) and the Education Commission of the States (Newman, 1990).

Responding to this call, a research chemist with the DuPont Company in Delaware, Dr. Chad Tolman, initiated a statewide Science Alliance in 1988. The Science Alliance is a coalition of industry, business, and formal and informal educational institutions cooperating in efforts to enhance precollege science teaching in Delaware and nearby areas. The Alliance decided to focus its initial efforts on the elementary school because of the number of obstacles elementary teachers encounter in teaching science. One of those obstacles is the lack of priority given science by school administration resulting in lack of time for teaching and planning of science (Johns, 1984; Schoenberger & Russell, 1986; Weiss, 1987; Wier, 1988). Another obstacle reported by many teachers is the lack of confidence in science teaching. This low confidence often stems from inadequate science training in both content and methods courses (Schoenberger & Russell, 1986; Stake & Easley, 1978; Tilgner, 1990; Weiss, 1987; Wier, 1988; Zeitler, 1984). Low science teaching confidence may also be the result of lack inservice support personnel in terms of science supervisors or well-trained individuals to provide the training and follow-up support needed for sustained change in teaching (Hord & Hurling Austin, 1986; Shamansky, 1989). A further obstacle is a lack of equipment and materials to teach activity-based science (Johns, 1984; Schoenberger & Russell, 1986; Weiss, 1987; Wier 1988).

The Science Alliance developed the Teacher-Scientist Partnership project to assist elementary teachers in teaching quality science by helping them overcome the barriers of low confidence and lack of materials. In addition, there was hope that the Alliance's interest in elementary school science might focus school administrators' attention on the subject as well. The teacher participants received training and equipment to teach a unit. In addition, approximately one-half of the teachers, the experimental group, received support in teaching the unit from a scientist partner. We hoped to determine whether combining the scientists' scientific expertise with the teachers' classroom expertise was a feasible and effective way to provide support for elementary teachers implementing a new unit from the perspective of the participants.

DESIGN AND PROCEDURES

After determining by survey that many teachers would be interested in such a partnership project, 20 fourth, fifth and sixth grade teachers from New Castle County, Delaware were chosen to participate. Nine taught in public schools; three in parochial schools. All 20 received six hours of training (two, three hour workshops) in the use of a SAVI/SELPH (S/S) module (activity-based unit developed by Lawrence Hall of Science, Berkeley). In addition, they received $250 worth of materials to teach the module. Funding for the project was provided by the DuPont Company.

The teachers were assigned to experimental or control groups based on their choice of unit and their schedules. Eleven teams were formed by teaming 12 teachers with 11 scientists. (Two teachers requested to work together with one scientist.) After training the eleven teacher-scientist partner teams taught the unit to the teacher's class. The other eight teachers, the control group, taught the unit on their own.

The eleven scientist volunteers who participated in the project included nine from DuPont (including research chemists and engineers) and two from the chemistry department of the University of Delaware (an assistant professor and a lecturer). Four of the scientists were women. Eight reported that they had taught at least one lessson to elementary school students in the last two years.

Training

The S/S workshops were led by Sandy Wolford of the Colonial School District who had extensive experience with S/S teacher training. The S/S modules used were "Mixtures and Solutions," "Scientific Reasoning" and "Measurement." The first workshop for each group provided the opportunity to work through the activities for the module and to discuss the teachers' responsibilities for the project. In the second experimental group workshop the teachers met their scientist partners. They reviewed the module through videotape and an overview by Ms. Wolford. The teachers worked through at least one activity with their scientist partners. The partners then worked out a teaching schedule and ordered materials. The second control group workshop included peer teaching of module activities. Each teacher presented either an extension activity suggested in the module or demonstrated how they had tried out a module activity with students.

The scientist volunteers' training for the project consisted of a "scientist seminar" as well as the workshop session with their teacher partners. The two hour scientist seminar was led by University of Delaware science educator, Dr. Nancy Brickhouse, who was assisted by the director of the project, Dr. Betty Wier. In the seminar the scientists were introduced to recent research in pedagogy and children's thinking about science concepts and to ways in which they might assist in the classroom.

After the training sessions the experimental and control groups taught their units over the next three months (from January to March 1990). The scientist partners had been asked to team teach at least three lessons. Some were able to participate more often -- one taught once a week for ten weeks.

Data Collection

Data were collected in several ways. First, teachers and scientists kept journals in which they described briefly how the lesson went, how the children responded, and how well the team teaching worked. Control teachers described the lessons and children's responses and explained whether it would have been helpful to have a scientist partner for the lesson. Second, all participants were asked to complete an evaluation form at the end of the unit in which they rated and provided their views of components of the project, including: the training, the unit, their partner's contributions to lesson (for the experimental group), whether their expectations were met, and the quality of the project. The students completed an evaluation form which asked them to explain what they liked about and learned from the unit and how they felt about having a scientist present (for the experimental group), and to give an overall rating for the experience.

Another method of evaluation was an "evaluation conference" held at the completion of the project. There the teachers and scientists met to discuss the project and give recommendations for further projects and partnerships. Additionally, formative evaluation procedures conducted during the project by the director included at least one telephone call to each teacher and visits to several experimental group classrooms to observe the partnerships in action. [Further evaluation was conducted to determine whether there were changes in teachers' and students' attitudes toward science over the course of the project and whether there were any differences in knowledge gained by students in control and experimental classrooms. These findings will be reported at a later time.]

During the next school year, 1990-91, follow-up evaluation was conducted by telephone interview. The purpose of the interview was to determine whether the teachers taught the unit again and whether they continued a partnership (for the experimental group) or would like to work with a scientist partner (for the control group).

FINDINGS

Responses about the project from all participants -- scientists, teachers and students in both experimental and control groups -- were positive. Informal classroom observations in four classrooms confirmed that the partnerships were working there. One of the eleven teams, however, reported that the partnership did not work out due to the teacher's lack understanding of her responsibilities.

Classroom observations and journal entries indicated that partnerships in the classroom typically worked in the following manner. The teacher set up the lesson and worked out management of materials and student teams. The scientist helped with materials and monitoring the students while they worked with equipment. The scientists also provided explanations about scientific concepts and, in several cases, they brought in additional materials or set up additional demonstrations related to the concepts in the module.

All participants, teachers, scientists and students, completing the evaluation at the end of the project gave favorable ratings to the components of the project. (See appendix for mean ratings of each component.) A description of ratings and comments from each group follow. (A scale of 1 to 5 was used in which 1 = unsatisfactory; 5 = excellent.)

Scientists' Responses

Nine of the scientist volunteers responded to the questionnaire. They rated the preparatory activities (i.e., Scientist Seminar and Partner Workshop) on several attributes (e.g., help in understanding children and classrooms, clarity of scientists' responsibilities, usefulness in teaching module, motivation). Both activities were rated similarly, with the means ranging from 4.1 to 3.9. For both sessions "motivation of participants" received the highest ratings and "clarity of responsibilities" received the lowest rating. Comments about the "most helpful" or "useful" aspects included these from more than one participant: "videotaped classroom segments" (3 responses) and "discussions of children's approaches/thinking about science" (3) for the Scientist Seminar and "videotaped samples of S/S lessons" (3) and "meeting the teachers" (3) were recorded as the most useful aspects of the Partner Workshop. Recommendations for improvement of the sessions made by more than one participant included: for the seminar "focus on more practicalities" (e.g. discipline) (2) and for the workshop providing a "better definition of scientists' and teachers' responsibilities (2) "more unscheduled time for discussion of lesson plans" (2).

The scientists' mean ratings of the SAVI/SELPH modules were generally high. They ranged from 3.8 to 4.4 for various attributes.

Almost all of the scientists commented favorably on the preparedness of the students and the teachers and their abilities to participate in the scientists' presentations. The scientists observed that the students "actively participated and asked questions" (3). The division of labor between teachers and scientists received a great deal of praise from the scientist volunteers. Seven scientists maintained that the "interplay between educational experience and scientific knowledge" was the most useful aspect of the team teaching. Some valued being involved in "constant action" or "a chance to watch a really good, experienced teacher draw ideas, concepts, and facts out of the students and generate enthusiasm." The scientists called for "more equipment and materials" (3) and "more chances to work together [with the teachers]" (3) to improve the team teaching.

The primary rationale for participating in the project for those who reported that they had expectations for the project was to enhance students' knowledge (3) or encourage a curiosity and enjoyment of science (2). One scientist hoped to learn more about children and their feelings about science and felt that the "long-term" classroom relationship afforded that opportunity. Seven of the nine volunteers reported unequivocally that their expectations for involvement were met and at least four of the seven expressed surprise at how well the project had gone. The two remaining scientists were ambivalent: "Some exercises were good, but [there was] not enough written work" and "[I] don't know [if expectations were met]. [I'd] like to know how well they learned."

The scientists described the best aspects of the project for themselves in the following manner "working with the students" (5), "the teach-scientist teamwork" (3), and "chance to interact with both teachers and students" (3). The scientist volunteers gave the project overall a unanimous 5.0 rating: "excellent."

At the evaluation conference the scientists emphasized that they could not have carried out the lessons on their own, although most thought that the teachers could have. Those who had previously done "one shot" presentations liked the opportunity to have extended contact with a class and get to know the students better. In addition, several expressed an interest in becoming more involved in the science program of the school.

Teachers' Responses

Training

Experimental Group Eleven of the 12 experimental group teachers returned evaluation forms. They gave high ratings to individual components of the project (training, units, work with scientist, response of students, and expectations met). Mean ratings of the first and second workshops ranged from 4.3 (clarity of teachers' responsibilities to project) to 4.8 (for motivation of teacher and usefulness in teaching module). Comments about the "most useful/helpful" aspect of the first workshop centered around "the opportunity to learn to use the SAVI/SELPH materials" (9 responses) and for the second workshop "meeting the scientist volunteer" (8) was cited frequently. Like some of the scientists, they recommended increasing the teacher-scientist planning time allotted at the workshops (6), for example inviting the scientists to both workshops would improve the workshops. (Interestingly, although some scientists felt more time for planning was needed, at the evaluation conference they indicated that they did not feel it was necessary, nor did they wish to attend both workshops.) Four teachers reported that "no improvement" in the workshops was needed.

Control Group Six of the eight control group teachers returned evaluation forms. Their mean ratings of all aspects of the first workshop were 4.8. The second workshop mean ratings ranged form 4.6 (clarity of teachers' responsibilities) to 5 (usefulness in teaching module). These teachers cited such things as "gaining an overall view of the program/ parts of the unit" as valuable in the first unit and "having to teach the lessons" and "the selection of the science materials" as the most useful aspects of the second workshop. The only recommendations for improving workshops included "adding a discussion of grading," clarifying the teachers' responsibilities," and disseminating an outline [of project procedures]." Three teachers indicated that no improvement was needed in the workshops.

S/S Modules

Both groups of teachers reported unanimously that they would continue to use the SAVI/SELPH modules in their classrooms in other years. The teachers in both groups gave high ratings to the modules. The experimental group teachers' mean ratings of module attributes ranged from 4.2 to 4.6; the control group teachers' ratings ranged from 4.7 to 5.0.

Partnerships

The experimental group teachers rated the scientist volunteer on several attributes and their mean ratings ranged from 4.0 to 4.9. Highest ratings were attributed to the "amount of information" presented by the scientist (4.9), the scientist's contributions to the "enrichment of the lesson" (4.9), and the scientist's "assistance with the instruction of the lesson" (4.8). "Assisting with classroom management" was the lowest rated attribute for the volunteers (4.0). When asked what was the most useful aspect of the team teaching, eight teachers cited the expertise and support of the scientist in their classrooms. Approximately six recommended improvements of the team teaching aspect of the project concerned more time for planning or teaching. Three indicated that no adjustments in the team teaching experience were necessary.

Expectations

All of the experimental group teachers indicated that their expectations for project involvement had been met. Those expectations included "giving students a chance to do 'hands-on' work (7) "expand their students' knowledge in content areas" (5) "work with a scientist volunteer (3). The teachers' reasons for their expectations being met included: "children's increased learning and/or subsequent test performance" (4), the "support of the scientist partner" (4), and the "children's enjoyment of the scientists" (3).

The experimental group teachers emphasized how valuable it was to have the scientist present to help with equipment, present concepts, answer questions, and bring in additional equipment and demonstrations. The mean rating of the overall quality of the project by this group was 4.9 (1 "good"; 10 "excellent"). The team who reported informally that their partnership did not work out did not complete a questionnaire. Furthermore, there was some indication in others' responses that more guidance on how to work with a partner would have been useful.

The control group teachers indicated that they especially liked receiving their own materials and the hands-on training. Four reported that their expectations had been met. Two indicated that their expectations had not been met because they were not teamed with a partner. (The control group teachers were promised a partner in the next school year.) Interestingly, their journal entries indicated an ambivalence among control group teachers about whether or not a scientist partner could have assisted them in the teaching of the lessons. Almost as many teachers thought a scientist might have been helpful as did not. The mean rating of overall quality of the project by these teachers was 4.7 (2 "good"; 4 "excellent")

Students' Responses

Approximately 330 experimental group student surveys and 230 control group studnet surveys were returned. To facilitate the analysis of the student survey data, a method of systematic sampling was employed -- yielding a survey sample of 84 (or 15%); 50 surveys in the sample were drawn from the experimental group and 34 for the control group. No confounding bias in the arrangement of the surveys per class was detected.

The students' responses were positive, regardless of whether they were in the experimental or control group. The comments given most often by students in both groups for enjoying the units were "doing the experiments" and "it was fun." These were also the comments made most often to explain how the lessons were different from usual science lessons. Students also commented positively on specific activities, for example, "mixing and separating solutions" "doing the 'fizz quiz'" "using the equipment (e.g. thermometers)" "monitoring heart rates."

All but one student in the experimental groups indicated that the scientist had been helpful. In their specific explanations, they mentioned most often that the scientist: "was a nice person" "explained things thoroughly" "[helped them] learn a lot of science" "helped the teacher" "used 'neat' experiments." Four students mentioned that the scientist "knew more than/ or was more experienced than the teacher."

The students in both groups reported learning many things form their respective units. The experimental groups did cite a greater number of different facts, attitudes, and behaviors. An example of the comments are: [I learned] "how to separate mixtures" "[that] I like science better" "how to use a syringe [to measure liquids]" "how to work in a group" "[that] you can't measure a car in grams" "[about] variables" "[about] predictions." When asked what else they would like to know about the topic studied, the most popular answer from both groups was "nothing." But beyond this response a variety of remaining questions were cited, for example, "Why do the solvents dissolve?" "How do I do more experiments?" "How do you measure gas?"

Both groups gave generally high ratings to the experience overall. Below are the mean ratings by unit and group.

	Experimental	Control
"Mixtures and Solutions"	4.1	4.6
"Measurement"	4.6	
"Scientific Reasoning"		4.6

[Note: Due to the scheduling complexities resulting from giving teachers a choice of unit, only "mixtures and solutions" was taught by both experimental and control groups.]

SUMMARY AND CONCLUSIONS

In summary, the project was perceived to be quite successful by participants in the experimental groups. As for the feasibility and effectiveness of elementary teacher and scientist partnerships, the responses from the partners were very positive. The desired results from combining the expertise of the partners occurred for all but one partnerships. The scientists' responses also indicated that they, too, gained confidence in working with elementary children. The experimental group students enjoyed working with the units and appreciated the scientists' help in the classroom.

On the other hand, the responses from the control teachers and students were also positive. The control group teachers were pleased to receive the training and, especially, the equipment. The students in the control groups enjoyed getting their hands on the equipment to "do experiments." It is possible, therefore, that providing teachers with equipment and enough training (in this project the training sessions were three to four times longer than normally provided for S/S module) and asking for some accountability -- that is, submitting evaluation instruments may have been enough motivation for the control group to teach the module and, therefore, to feel positive about it.

In any event, the project experience helped us learn some things about setting up elementary teacher-scientists partnerships. For example: (1) Providing materials and equipment is very important. Many schools lack adequate science equipment and some teachers indicated they signed up for the project because of the promise of materials. (2) Training is essential for teachers and for scientists. Journal entries by at least one teacher indicated that the scientist was very helpful with the lesson as written but when he added information or activities they were sometimes above the students' level. This information along with reports of previous experiences with scientists who brought their own lessons which were often inappropriate for elementary students convinced us that training scientists for the classroom was essential. (3) We also sensed that more guidance about how a partnership might work would be important. Comments in journals and at the evaluation conference along with lower ratings by teachers and scientists for "clarification of responsibilities" indicate a need for assistance in how to work as a team. (The lower ratings may have also indicated that the teachers needed more information about the evaluation forms for which they were responsible.) It seems especially important to help the scientists and teachers determine their partners' expectations so that they could work effectively and feel positive about their contributions. In at least one case, it appeared that the teacher had hoped that the scientist would do more "teaching." But the scientist had felt that the teacher was very well prepared and he was there as support and did not want to "take over." So the teacher's expectations were not entirely fulfilled. In another case, an extremely well organized teacher apparently made the scientist feel somewhat "unnecessary." Thus, in any future partnership programs, we would include "expectations" on the information form that the partners complete and share at their first meeting.

FOLLOW-UP EVALUATION

We wondered what longer term effects there may have been from the project. That is, for example, "Did the teachers continue to implement the unit? Did teachers and scientists remain partners? Were there more disadvantages to partnerships than benefits?

In the following school year, 1990 - 91, questionnaires were sent to the teacher and scientist participants of the project asking them to indicate whether they were interested in continuing with their partners or being placed with a new partner for teaching the S/S module or another unit. Arrangements to find partners for at least the control teachers who wanted a partner were to be made by the Science Alliance Volunteer Coordinator.

The questionnaires were followed-up by a telephone interview in January 1991. During the interview teachers were asked a) whether they had taught the S/S module in the '90-'91 school year, b) whether they taught it with a partner (or would like to), c) if they had utilized a scientist in any other way in their classrooms, and d) what they found to be the advantages and disadvantages of having a scientist partner. The scientists were asked, a) what project benefits there had been for themselves, b) what the disadvantages had been, c) whether they had been a teaching partner with an elementary teacher that school year, and d) whether they would like to remain involved in elementary science.

Scientists Volunteers

The interviewer was able to contact nine of the eleven scientist volunteers. Of the two who could not be contacted, one had taken a position in another state and the other could not be located. All nine rated the program "positive" and eight reported that they personally had a positive experience. They noted that the experience had been "rewarding" " and it had given them a chance to "establish rapport" with a group of students. Six were willing to continue a partnership with the same or different partner and to be involved with elementary science. One of those had continued working with her teacher partner. Three were unable to continue in the current year due to increased work loads or medical reasons.

Experimental Group Teachers

The interviewer was able to contact nine of the twelve experimental group teachers. All nine indicated that they taught the S/S module during the current year and reported increased confidence in teaching it the second time. All gave the project a "positive" rating. They reported the following as advantages to having a scientist partner in the classroom: the presence of a role model (9 responses) and the scientists' expertise (8). All indicated that receiving equipment/materials was an advantage; six indicated that they became involved because of the promise of materials.

Four indicated that they would like to have a scientist partner to teach a new unit. Of those four, one had continued the original partnership to teach the original S/S unit, with revisions, and to collaborate on another unit in the scientist's area of expertise. One other partnership had a limited continuation with the scientist coming in to conduct a demonstration, but this teacher expressed an interest in a a teaching partner in the future. Another teacher was working with a scientist who was involved with the Science Alliance but not with the project. They were not team teaching, however, the scientist brought in his own activities once about every six weeks.

One of the teachers who could not be contacted had been transferred out of state (a nun teaching in a parochial school). The interviewer contacted her replacement who indicated that she would like to teach the unit since the equipment had been left with her but she did not have time to learn how to teach the unit or work with the scientist since she was just getting started in the classroom.

The disadvantage of working with a scientist partner reported by four teachers was an increase in planning time (too much of a hassle for planning and scheduling). In addition, one indicated that having a scientist partner might imply that the teacher or program inadequate. Thus, it was important to make clear that the Science Alliance was enhancing or facilitating science teaching not improving it.

Control Group Teachers

The interviewer was able to contact six of the eight control group teachers. All reported that they taught the S/S module for the second time and that they felt comfortable with it. Three indicated that they would like to have a scientist partner for another unit or activities. Those who did not request a scientist included two who felt confident about teaching science, one of those said she had no time to plan with a partner anyway, and a third who was taking early retirement.

FOLLOW-UP SUMMARY AND CONCLUSIONS

All participants contacted commented positively about the project. All teachers contacted reported that they taught the unit again and that their confidence in teaching it had increased. Although all but one experimental group teacher reported a positive personal experience with the partnership, only four experimental group teachers indicated they would like to work with a partner in the future. Three control group teachers requested a partner. Thus, there were seven teachers interested in partners -- approximately 50% of those contacted in follow-up interview. The reasons given most often for not requesting a partner were: extra time needed for planning and having enough confidence to teach the unit on own.

We asked ourselves, "How successful was this program for the long term?" In terms of teachers gaining confidence in implementing an activity-based unit, it appeared successful. How effective the lessons were would require classroom observations and more adequate assessment than the paper and pencil test given in this project. But the training and equipment did appear to help these teachers overcome the barriers of low confidence and lack of equipment for at least one unit. There was also some indication that administrators paid attention to the project. Building and district administrators of the teacher participants had been informed about the project by letter and the interest in science education shown by the Science Alliance may have had positive effects in increasing the administrators' awareness of the important of elementary school science.

Was the project successful in terms of support given by the scientist partners? Certainly the participants' comments were positive. Were the lessons more effective or the long term effects better for the experimental group? This would need more study, for example, observations and better assessment instruments.

What should the future of partnership projects be? This experience indicates that a lot of assistance is needed by the Science Alliance (or similar organization) to help set up effective partnerships. They do not just happen. The only partnership which continued and the other "working relationship" which resulted from the project had one striking thing in common: the scientists had children in the school where they remained active. Indeed, other scientists commented that they would be most interested in remaining involved in elementary science if they could work in schools where their children were enrolled. Thus, the scientists' commitment to their children's schools must be taken into account.

The Science Alliance is now working on "adopt-a-school" partnership projects. In these projects we work with individual schools where several teachers have expressed an interest in working with scientists. It seemed that focusing attention on specific schools might be a more effective way of making a significant difference in helping teachers gain confidence and enhancing the science program than a scattershot approach. Some of the ideas which are being tried out include 1) a K-5 school where several scientists are involved, one working at each grade level as a teaching partner or consultant/resource person and 2) another primary/special education school in which the monthly "breakfast with a scientist" has become popular with teachers who enjoy the chance to talk informally with a scientist on a topic they have chosen.

The Science Alliance realizes that scientists who work with teachers and children must receive training which includes information on research in science education and appropriate curriculum materials and teaching strategies. The Alliance is developing methods to provide this training while recruiting interested volunteers.

Another issue which needs to be addressed is the amount of extra time needed by teachers to work with scientist partners. Suggestions to help with the problem of time include: summer sessions when teachers, at least, are not so overwhelmed with school responsibilities and/or providing more planning time in workshops. But, whatever the situation, the benefits of working in partnerships will need to be perceived as overcoming the disadvantage of the time it takes to develop partnerships for these associations to be comfortable and effective.

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APPENDIX

PROJECT EVALUATION
Participant Mean Ratings of Project Component

Key:
5 - Excellent
4 - Good
3 - Average
2 - Below Average
1 - Unsatisfactory

SCIENTIST VOLUNTEERS

N=9

Scientist Seminar

4.0 Help in understanding fourth through sixth grade children and classrooms
3.9 Clarity of scientists' responsibilities to project
4.0 Motivation of scientist participants

Partner Workshop

4.0 Usefulness in teaching module
3.9 Clarity of scientists' responsibilities to the project
4.1 Motivation of partners

Perceptions of SAVI/SELPH Module

4.4 Usefulness or relevance of information presented
3.8 Amount of information presented
4.3 Clarity of major points
4.4 Motivation of teachers and students
4.2 Choice of format in module (e.g. - activities, demonstration)

Overall Quality of Project $\bar{X} = 5$

EXPERIMENTAL GROUP TEACHERS
RATING OF PROJECT COMPONENTS

(N=10)

Perceptions of SAVI/SELPH WORKSHOPS

First Workshop	Second Workshop	
4.3	4.3	Clarity of teachers' responsibilities to program
4.8	4.8	Motivation of teacher participants
4.8	4.7	Usefulness in teaching module

Perceptions of SAVI/SELPH Module and Scientist Volunteer

SAVI/SELPH Module	Scientist Volunteer	
4.3	4.7	Use of instructional time
4.5	4.8	Clarity of major points
4.6	4.6	Motivation of students
4.2	4.9	Amount of information presented or addition of information as needed
4.3	4.8	Choice of format (e.g. activities, demonstration) or change of format as needed
	4.7	Assisting teacher with equipment
	3.9	Assisting teacher with classroom management
	4.8	Assisting in instruction of concepts
	4.9	Enrichment of lesson
	4.5	Use of additional resource materials
	4.6	Pace of presentation

Overall Quality of the Partnership Project $\bar{X} = 4.9$

CONTROL GROUP TEACHERS
RATINGS OF PROJECT COMPONENTS

N=6

Perceptions of SAVI/SELPH Workshops

First Workshop	Second Workshop	
4.8	4.6	Clarity of teachers' responsibilities to project
4.8	4.8	Motivation of teacher participants
4.8	5.0	Usefulness in teaching module

Perceptions of SAVI/SELPH Module

5.0	Satisfaction of my professional needs
5.0	Usefulness of topic
4.7	Amount of information presented
5.0	Use of instructional time
5.0	Clarity of major points
4.8	Motivation of audience
5.0	Choice of format (e.g. activities, demonstration)
5.0	Use of resource materials/equipment

Overall quality of the project $\bar{X} = 4.7$